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ABSTRACT

This monograph presents an auto-tutorial unit that deals with the basic techniques involved in the use of the microscope. It can be used with high, medium or low level achieving students. No prerequisites are indicated. The Behavioral Objectives listed are aimed toward the students' recognition of the major components of the scope and the students' ability to focus the scope at any magnification within the capabilities of the microscope. Equipment and materials included in the packet are: (1) Student Script, (2) Student Guide, (3) Vocabulary List, and (4) Evaluation Form. Materials which must be made available to the student include (1) a glass slide with a printed letter taped to it and (2) a Bausch and Lomb Academic 255 Zoom Microscope. Time suggested to complete the lesson is 15 minutes. (EB)

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INTRODUCTION TO THE B & L ACADEMIC 255 ZOOM MICROSCOPE

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June 30, 1973

Printed and disseminated through the office of the Del Mod Component Coordinator for the State Department of Public Instruction, John G. Townsend Building, Dover, Delaware 19901

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A-T TEACHER'S GUIDE

Packet Number - AT 578
J

Subject - Biology

Grade - 10

Level - H M L

Prerequisites - None

Behavioral Objectives - 1. Given a B & L Academic 255 Zoom Microscope, or a diagram of the same, the student should be able to name, with 100% accuracy, its major components.

2. Given a B & L Academic 255 Zoom Microscope, a glass slide with a printed letter taped to it, the student should be able to mount the slide on the stage and focus the letter or any portion thereof at any magnification within the capabilities of the microscope.

Time - 15 minutes

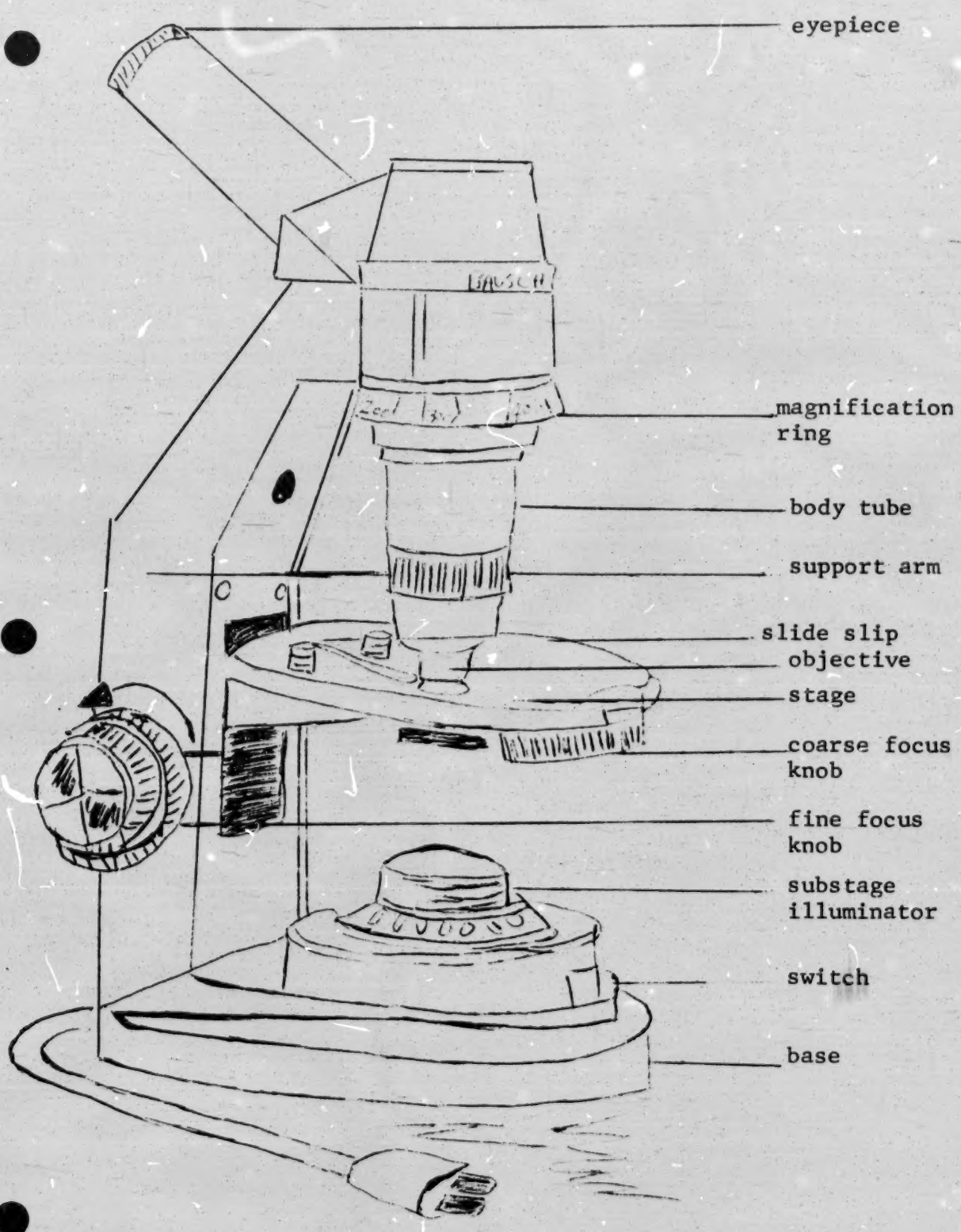
Equipment and Materials (*included in packet; **must be prepared in advance)

*Script
*Student Guide
*Vocabulary
*Evaluation
*Glass slide with printed letter taped to it.
**Bausch & Lomb Academic 255 Zoom Microscope

Sample Evaluation - See Student Guide

Space Required - _x_ carrel _____ other
NOTE: Carrel must be provided with 110-120v, 60 cycle electricity)

The Bausch & Lomb Academic 255 Zoom Microscope



NOTES:

EVALUATION

Fold along this line, tear off the bottom portion and hand in.

Name_____ Period_____

Date_____

Name three differences in appearance of the letter to the unaided eye and as seen through the microscope.

1._____

2._____

3._____

4._____

5._____

6._____

7._____

8._____

STUDENT GUIDE

Light Microscopy
Basic Techniques - Introduction to the B & L Academic 255 Zoom Microscope

Use this guide to write any notes or comments you wish to keep from this experience.

At the end of this lesson you will be able to:

1. Identify the main parts of the Bausch and Lamb Academic 255 Zoom Microscope.

2. Mount and focus a prepared slide at any magnification within the capabilities of the microscope.

Take out a pencil or pen; put on the headphones; turn on the tape player and follow the taped instructions.

NOTES:

SCRIPT

Basic Techniques--Introduction to the B & L Academic 255 Zoom Microscope

In this A.T. you will learn how to use one of biology's most useful tools--the microscope. A microscope is an instrument which helps us see very small objects. Because of the nature of what it does, the microscope is a very expensive and delicate piece of scientific equipment and although easy to use, its operation requires chat you handle it with great care.

Keep these thoughts in mind while you are using this A. T. and remember--if you don't understand a part of your instructions you can always re ind the tape and hear them again.

Let's take a look at the microscope and find out what its parts are and how to use them. In your student guide is a diagram of the microscope. Find it and place it nearby so you can refer to it as we go along.

Let's start with something familiar. Somewhere, attached to the base of the microscope, you will find a plain old electric cord with a plus on the end. Plug it into the electrical source of the carrel and turn on the switch located on the substage illuminator of the scope. You can tell if you've done this correctly because a light will come on--did it? See, you're an expert already.

Perhaps you've noticed that this microscope is a little different from most you've seen. It appears to have fewer parts than other microscopes. That's because it is a zoom microscope. What we mean by zoom in a microscope is essentially the same thing we mean by zoom in a camera. Between the lowest and the highest magnification of the instrument we have an infinite number of points at which we can stop to examine a specimen. This makes this microscope much more versatile than one which has only two or three points of magnification. The B & L Academic 255 Zoom microscope can magnify an object anywhere from 100 to 500 times normal size. Let's find out what we must do in order to vary the magnifying power of our scope.

You will notice a glass slide in the carrel, with a small piece of paper taped to its surface. Pick it up and look at it to determine what letter is taped to it. Place the slide, tape side up on the stage, slipping it under the slide clips and positioning it so the letter is located directly over the hole in the center of the stage.

On the body tube of the microscope you will see a gray ring with numbers on it. Adjust this ring so that the 100 is opposite the white line on the body tube. This is low power magnification

on the microscope.

Find the coarse focus knob. This will be the large outer knob of the pair. Turn it in the direction of the arrow in your diagram until the stage won't go up any further. Don't force it.

Look through the eyepiece at the top of the body tube and very slowly turn the coarse focus knob in the direction opposite the arrow on your diagram until the letter comes into focus. Perhaps you can see only part of the letter in the edge of the field (the circular area you see when looking through the eyepiece). This means that the letter is not centered on the stage and you will have to move the slide a little bit in one direction or another in order to center it. To do this, place your thumbs on either end of the slide and gently push it one way or the other, observing what happens through the eyepiece. Notice how the letter appears to move in the opposite direction from that in which you push the slide. Can you guess why that might be?

Choose a small portion of the letter and center it in the field. Place your hand on the grey ring and slowly turn it, observing what happens through the eyepiece. One of the following might occur:

1. The part you are observing may move out of the field as you increase magnification. Very gently center it again. Notice how much more critical the movements of the slide are at higher magnifications.

2. The object may become fuzzy and out of focus. Using the fine focus knob, the smaller of the two focusing knobs adjust focus by turning it one way or the other until the picture is again clear and sharp. When the grey ring has turned as far as it will go, check the number opposite the white line on the body tube. It should be 500--indicating high power magnification.

That's all there is to it. If you're not really sure of your technique and want to practice, go ahead and rewind the tape and go through this procedure as many times as you wish until you feel comfortable with it.

Now that you've gotten the basic procedure, let's have some fun estimating the magnification. This will help you become more familiar with the field as well as sharpening your newly acquired skills with the microscope.

First, take a good look at the letter under low power. Compare its size with the rest of the field. How much does it cover? Now, adjust the grey ring to high power and make the same comparison.

Here's the fun part. Starting at low power, turn the grey ring up some but don't check the numbers--estimate the magnification according to your mental image of the letter as it appears now and as it appeared at both 100X and 500X. After you've made your estimate, check the numbers on the ring to see how close your guess was. Stop the tape if you wish and run a few more trials in the same way.

How did you do? Were your estimates improving as you made more trials? This, again, was practice to build your skill with the microscope, an instrument you're going to want to be using automatically so that you can put the greater part of your attention on observing what's on the stage.

Speaking of the stage, let's review, briefly, the parts of the microscope we've been discussing and pick up a few we've missed along the way. Refer to your diagram and the microscope as we go along. If you wish, you may use a little trick to help you remember the parts as we discuss each. It's a simple thing, but is really effective and you may remember something like it from our discussion of SQ4R. When each part is mentioned, place a finger of one hand beneath its name on the diagram and a finger of the other hand on that part on the microscope. It works--try it.

Let's start at the base. This is the structure which holds everything together--the main support of the microscope. The substage illuminator, which we've already discussed is located in the base and transmits light upward to the stage where the specimen or object under observation is located. Slide clips hold the slide containing the object on the stage and the light passing through the hole in the stage and object is transmitted to the first lens of the microscope--the objective. The objective is located in the lower part of the body tube. About half way up the body tube is the grey magnification ring which determines the amount of enlargement of the object anywhere in the range from 100X or low power all the way up to 500X or high power. At the top of the body tube is another lens, the eyepiece, which transmits the final, magnified image of the object to your eye. Located on the lower portion of the support arm are the focusing knobs. The larger, outer knob adjusts the coarse focus and is adequate at lower powers. The fine focus knob, located inside the coarse focus knob adjusts the focus in smaller amounts for focusing at higher powers. And the most important part is located directly behind the microscope--that's you. Without a skillful observer

adjusting the microscope to get the best and most useful view of the specimen, the microscope is worthless.

At the end of this tape, answer the few questions in the evaluation on the last page of your student guide. Turn off the switch on the substage illuminator, unplug the power cord, remove the slide from the stage and place it beside the microscope.

Rewind the tape and leave the carrel exactly as you found it. Hand in your evaluation sheet and you're finished.

STUDENT SUMMARY, OBSERVATION, AND RECORD SHEET

VOCABULARY

field	- circular area which is seen through the eyepiece of a microscope.
low power	- the least amount a specimen can be magnified with a given microscope.
high power	- the greatest amount a specimen can be enlarg with a given microscope.
zoom	- process in which a microscope is able to progress from low power to high power (or the reverse of this) in a smooth transition without changi lenses.
magnification	- increasing the appearance of an object.
specimen	- object under observation.
"X"	- symbol used to indicate power of magnification.